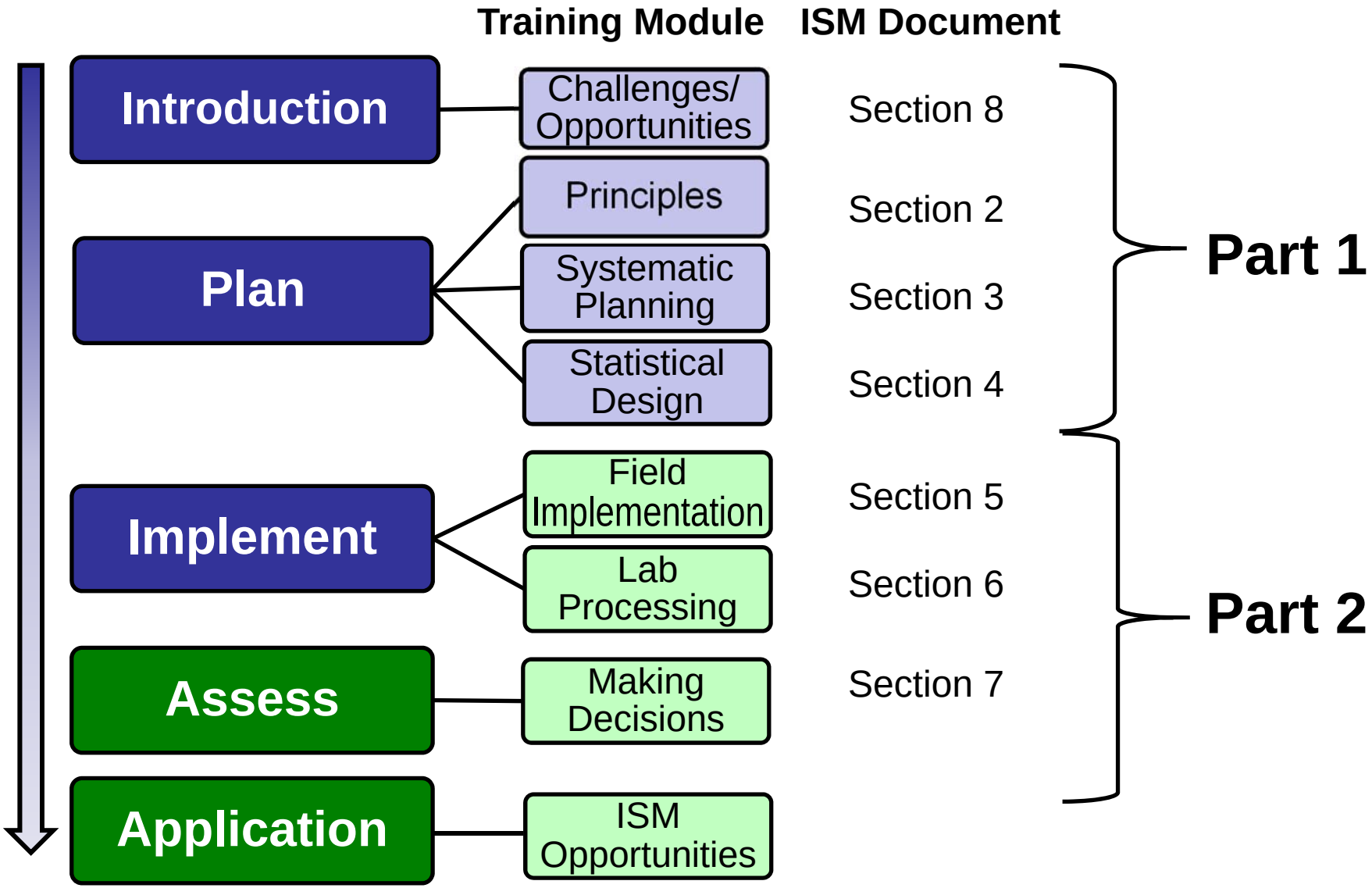
ISM Document and Training Roadmap



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Field Implementation Learning Objectives

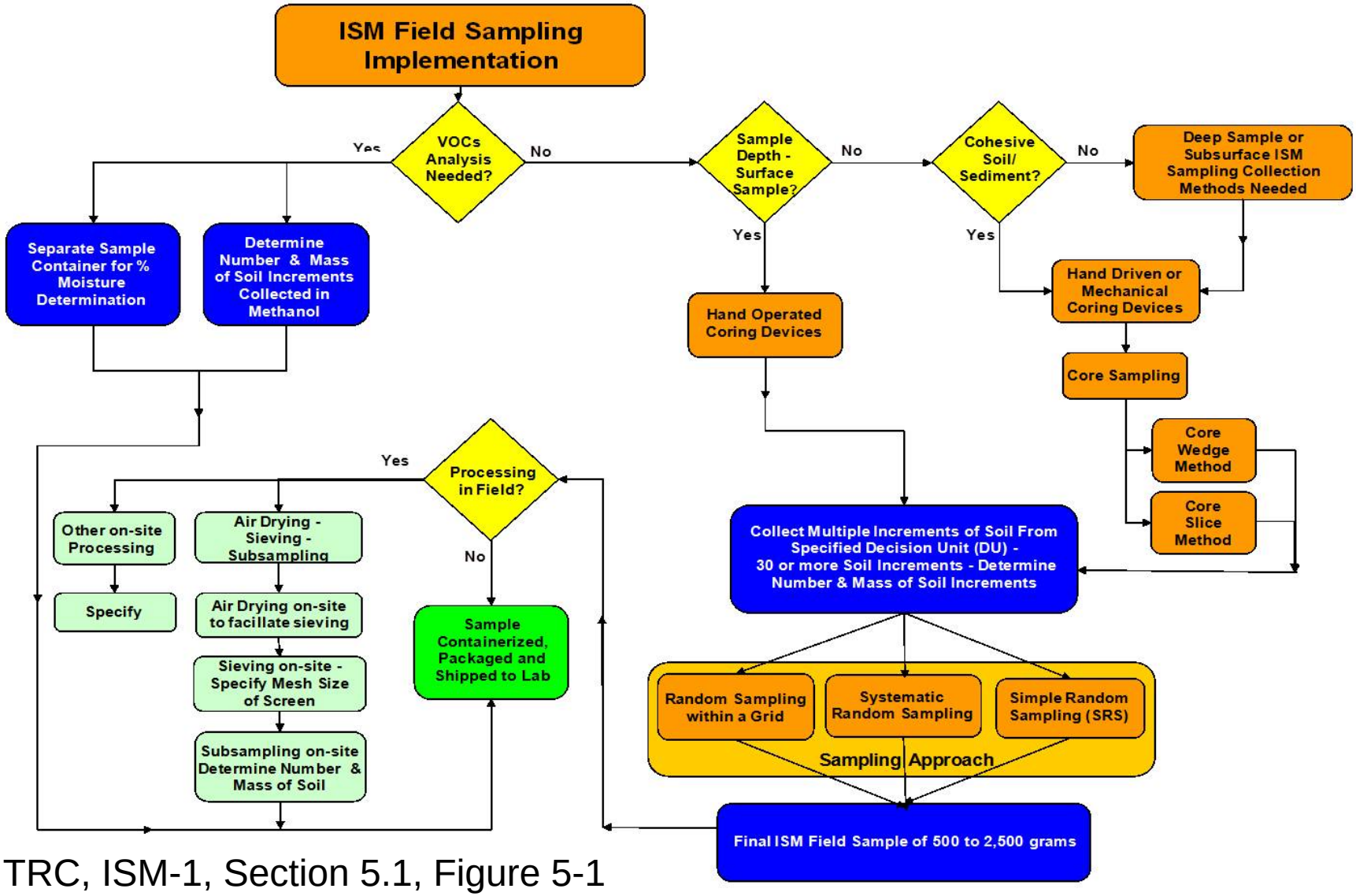
Learn how to:

- Collect an ISM sample
  - Understand the similarities and differences between surface and subsurface ISM sampling
  - Consider issues specific to non-volatile and volatile ISM sampling
  - Implement and collect ISM replicate samples

Key Presentation Topics

- Sampling design
- Sampling tools
- ISM surface/subsurface sampling
  - Cores and subsampling
- Specific contaminant of concern (COC) considerations
  - Non-volatile and volatile
- ISM replicates

ISM Field Sampling Implementation



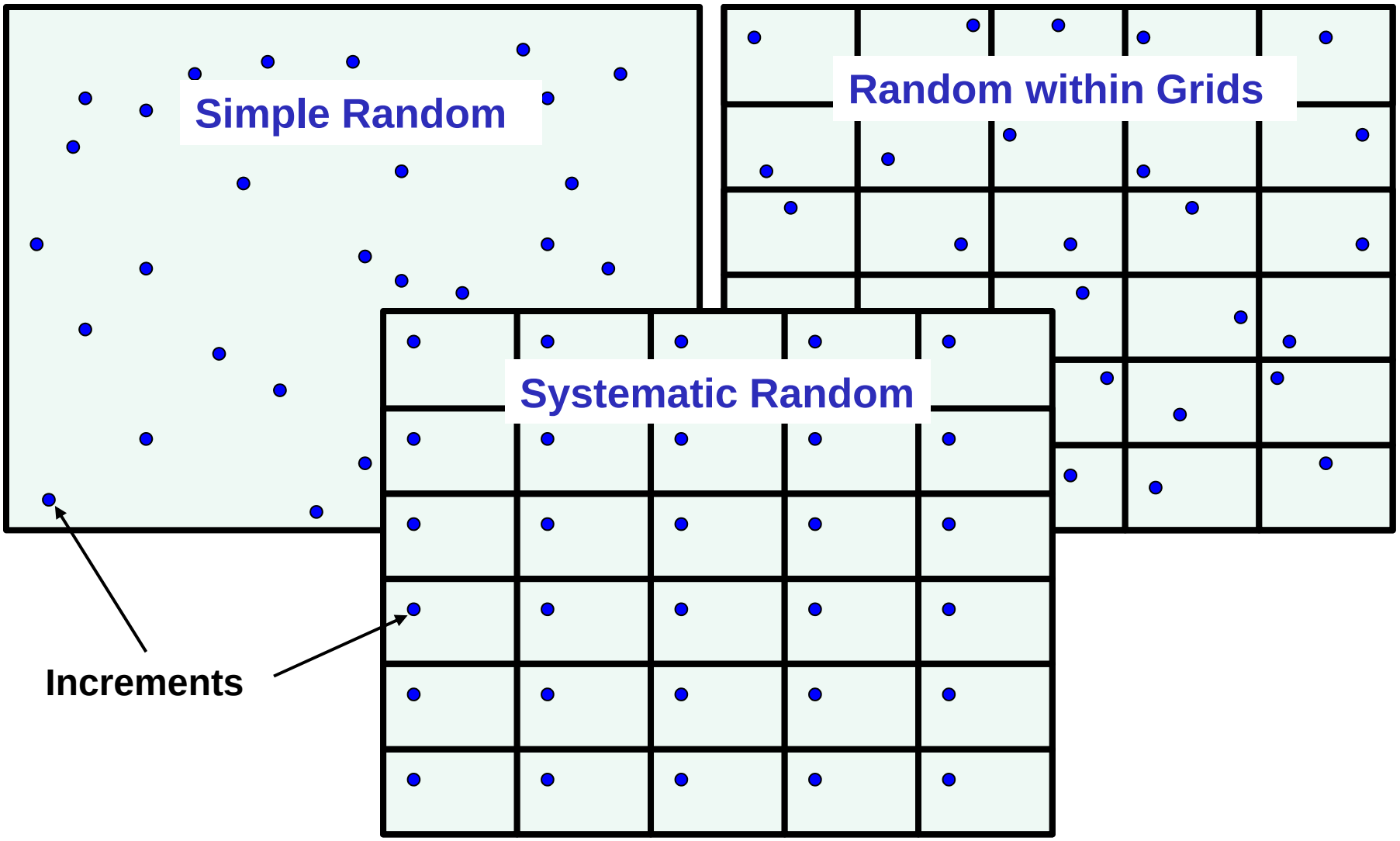
ITRC, ISM-1, Section 5.1, Figure 5-1

Sample Collection Components

- Decision Unit (DU) sampling design
  - Simple random sampling
  - Random sampling within a grid
  - Systematic random sampling
- Sampling tools
  - Core shaped
  - Adequate diameter
- Mass
  - Increment mass
  - Sample mass

ITRC, ISM-1, Section 4.3.4.2

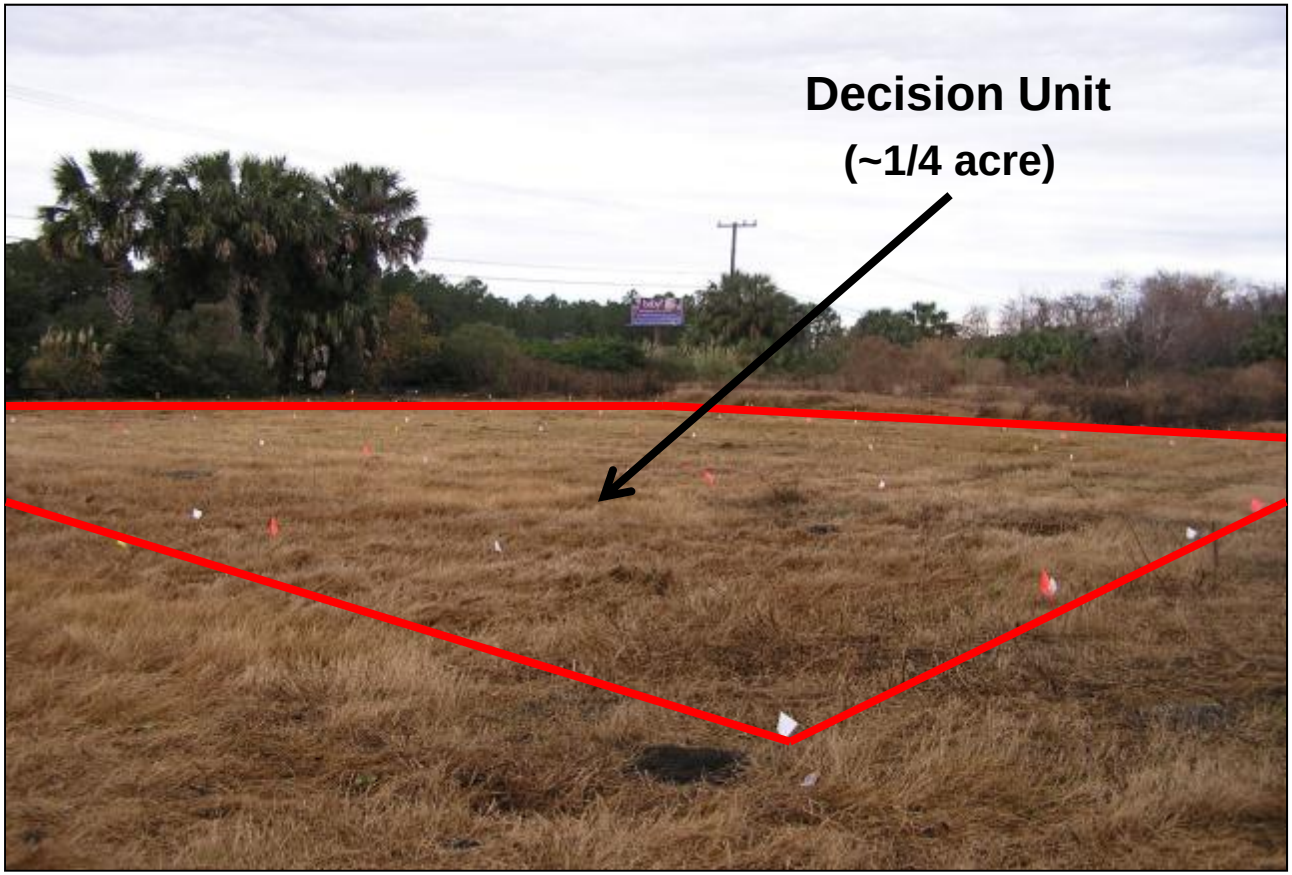
Sampling Designs



ITRC, ISM-1, Section 4.3.4.2 & Section 5.3.1, Appendix A1

Florida Case Study: Decision Unit (DU) Identification

- Identify DU in the field
  - Use typical environmental site investigation procedures
  - Examples
    - Survey
    - GPS
    - Swing ties



ITRC, ISM-1, Section 9.3 & Appendix C, Section C.3

Increment Locations

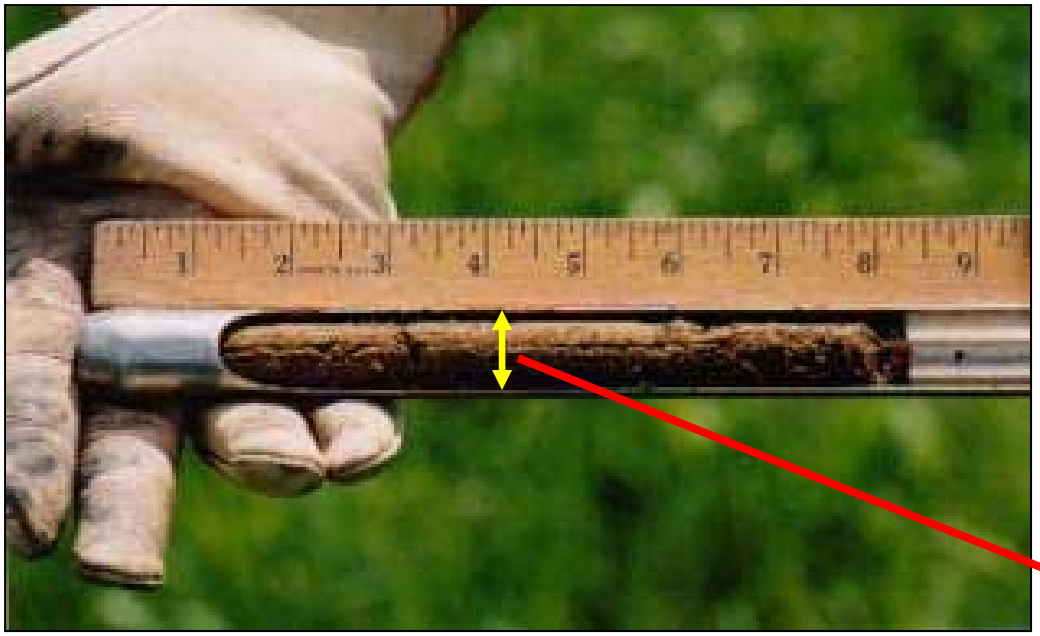
- Identify increment locations in field
  - Utilize similar site investigation tools

ITRC, ISM-1, Section 5.3.1

Florida Case Study:
Increment Field Determination

Sampling Tool Considerations

- Criteria - shape
  - Cylindrical or core shaped increments
  - Minimum diameter required – based on particle size (soil fraction) of interest



e.g., core diameter >16 mm

ITRC, ISM-1, Section 5.2

Additional Considerations

- Decontamination
  - Not necessary within DU (including replicates)
- Sampling tool
  - Appropriate for matrix and contaminant of interest

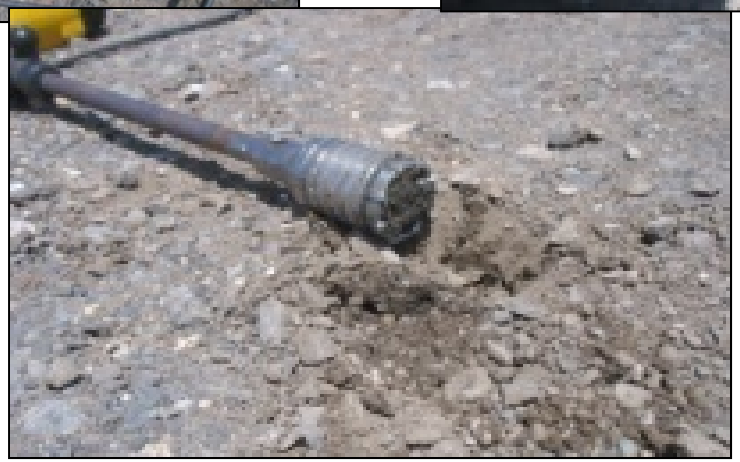
ITRC, ISM-1, Section 5.2

Sampling Tool Examples

Soft Surface Soil

Source: Courtesy http://www.jmcsoil.com/index.html
http://fieldenvironmental.com/evc-incremental-sampler.php

Alternate Sampling Tools



Hard Surface Soil

ITRC, ISM-1, Section 5.2; Figure 5-2b

Florida Case Study:
Field Sampling

Florida Case Study: "Low Tech" Sampling Tools

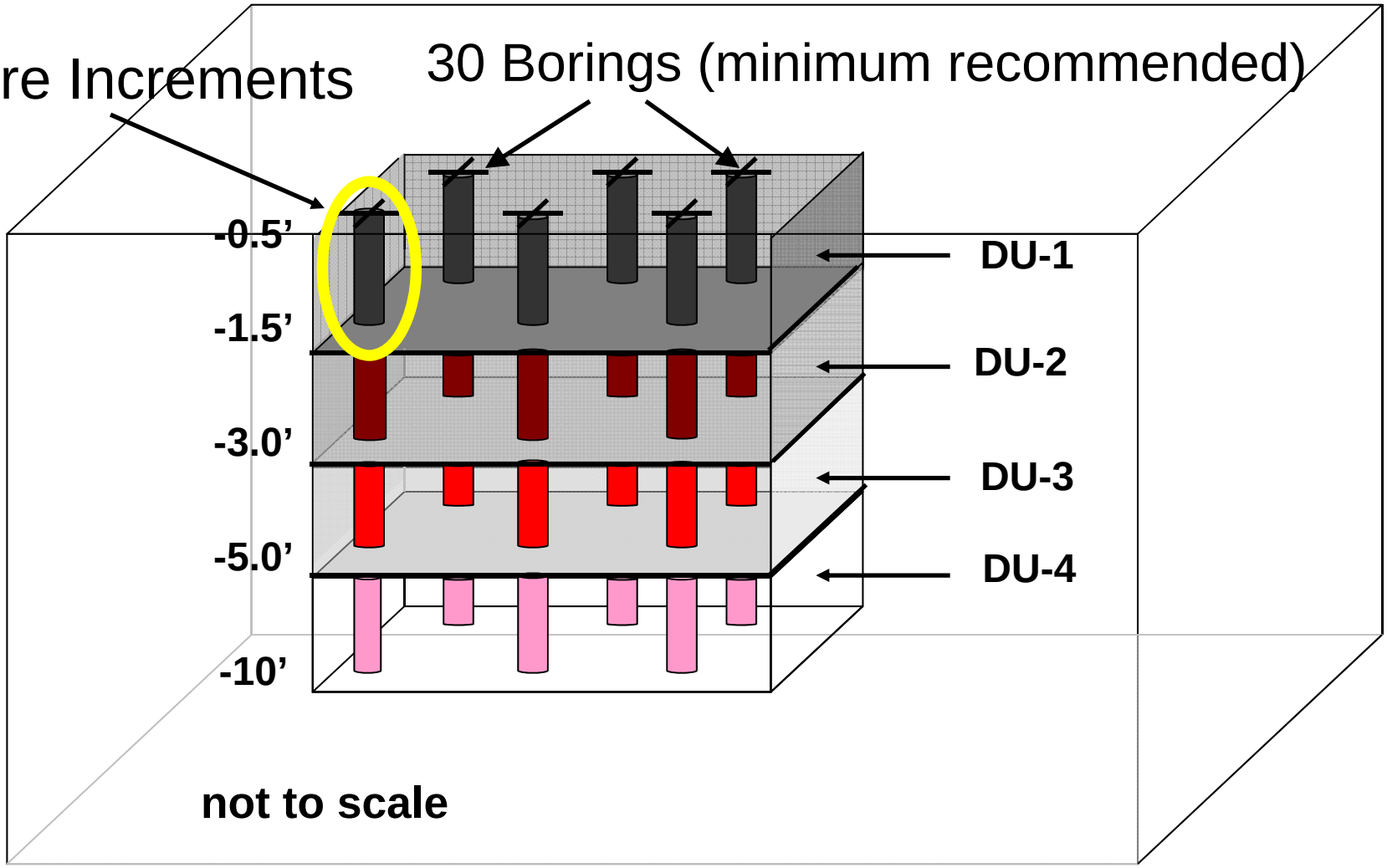
Adequate Sample Mass

- Criteria – mass (non-volatile)
  - Recommended mass per increment: 20-60 grams
  - Final ISM samples: generally 600-2,500 grams

$M_s = \rho \bullet n \bullet D_s \bullet \pi \bullet (q / 2)^2$
M_s – targeted mass of sample (g)
D_s – increment length (cm)
n – number of increments
ρ - soil or sediment density (g/cm^3)
q - diameter of sample core (cm)

ITRC, ISM-1, Section 5.3.1

Subsurface Decision Units (DU)



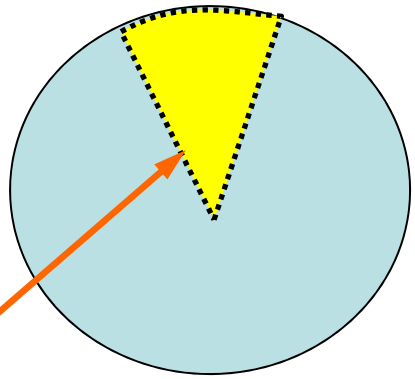
Individual core samples *combined* to prepare an ISM sample for each DU

Subsurface Sampling Considerations

- **Preferred increment – entire core interval**
- Core subsampling alternatives
  1. Core wedge
  2. Core slice

ITRC, ISM-1, Section 5.3.2

Core Wedge



e.g., wedge width >16 mm

Continuous wedge removed from entire length of targeted DU interval for 100% coverage

ITRC, ISM-1, Section 5.3.2.1

Core Slice

Core Slice removed from randomly selected interval length of targeted DU depth

ITRC, ISM-1, Section 5.3.2.1

Field Processing for Non-Volatiles

- ISM sample processing in a controlled laboratory environment is recommended to reduce error
- Field processing may be applicable if project specific DQOs can be met

ITRC, ISM-1, Section 5.4.1

Florida Case Study:
Non-Volatile ISM Sample Logistics

- Final ISM samples: typically 600-2,500 grams or more
  - Containers, storage, shipping
- Laboratory
  - Facilities and equipment for correct processing and subsampling

ISM Volatile Sampling Tools

- Core type sampler
- Typical for VOC soil sampling per SW846 5035A

ITRC, ISM-1, Section 5.4.2

Source: Courtesy www.ennovativetech.com

ISM Volatile Samples – Subsurface

- Numerous increments collected across core/depth interval

ISM Volatile Sample Logistics

- VOC preservation and analysis
  - Increments are extruded from sampler directly into volume of appropriate container with predetermined methanol
  - Methanol preserved sample submitted to laboratory
  - Note shipping restrictions/ requirements

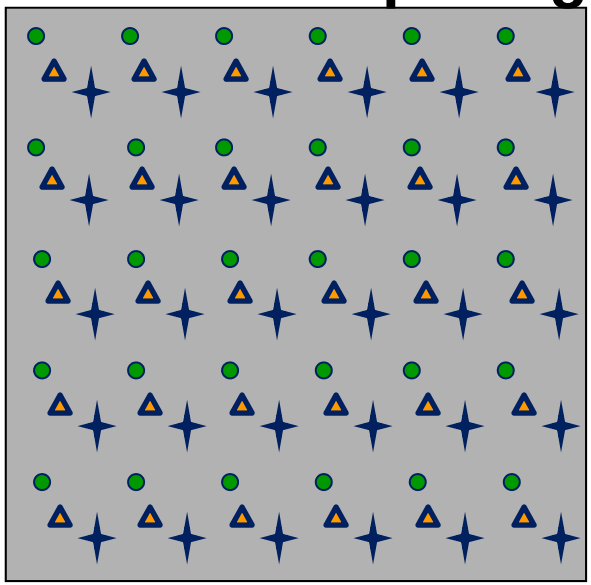
ITRC, ISM-1, Section 5.4.2, Figure 5-11

Replicates Recommended

- Increments collected from alternate random locations
  - Independent samples, not “splits”
- Minimum 3 replicate set for statistical evaluations
- Additional replicates may be necessary depending on contaminant heterogeneity and project specific DQOs

Replicate Spacing and Collection

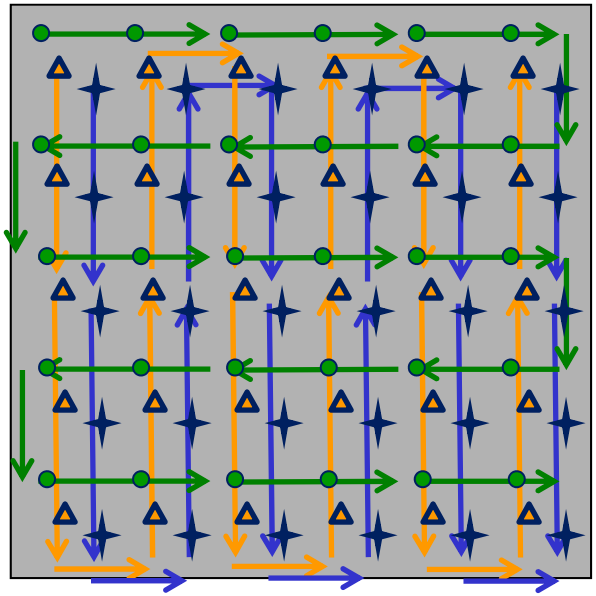
Replicate Increment Spacing



Decision Unit

R1 R2 R3

Sample Collection



Decision Unit

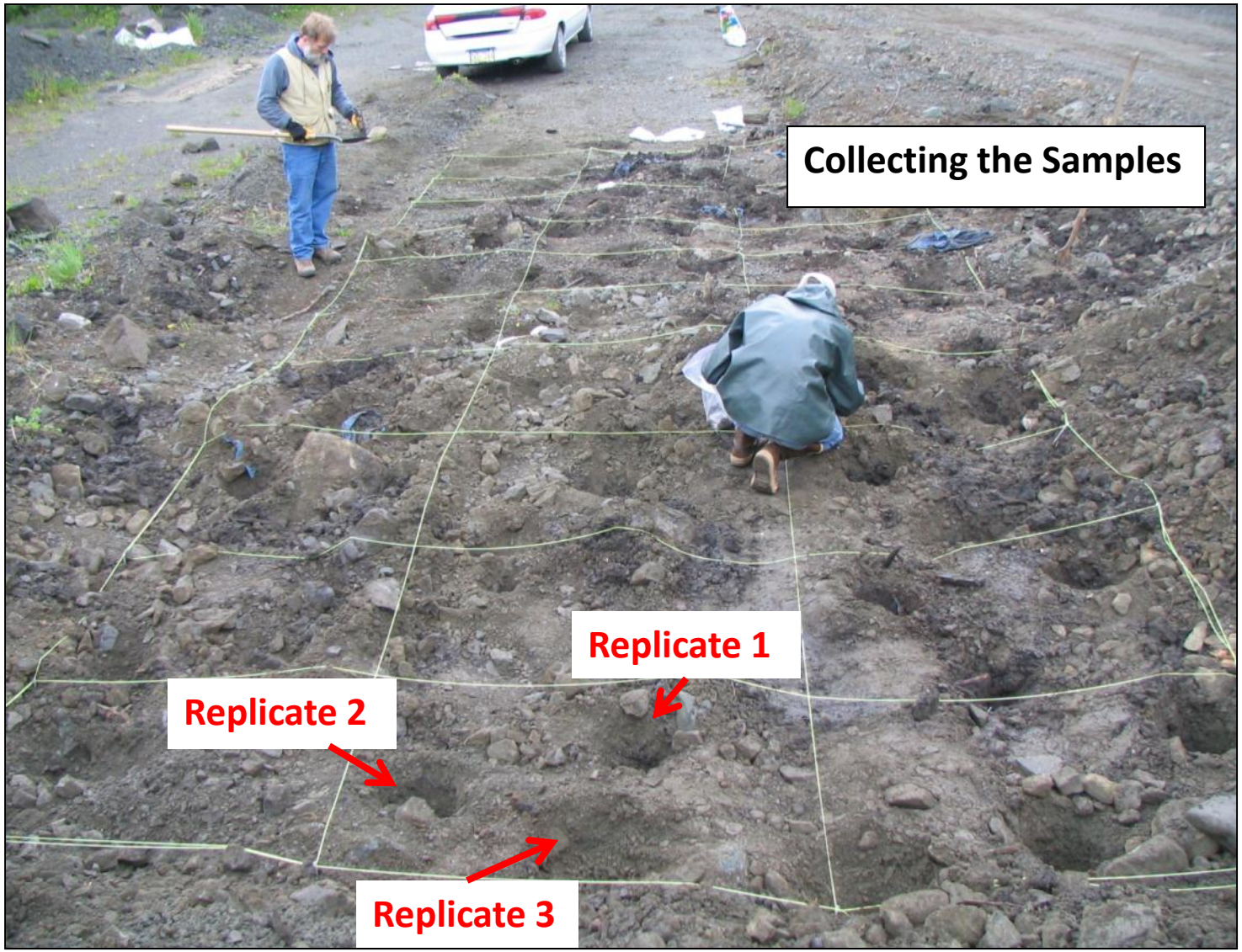
Replicate 1

Replicate 2

Replicate 3

ITRC, ISM-1, Section 5.3.5

Field Replicates – Simple Example



Replicate/Sampling Reminders

- Replicates
  - What type
  - How many
  - Where/when will they be collected
  - How will they be evaluated
- "Homogenizing" or mixing not necessary
  - Laboratory processing and subsampling (following module) designed to attain representative analytical sample

Field Implementation Summary

- Determined during Systematic Planning
  - Sampling design
  - Adequate sampling tools
  - ISM surface/subsurface sampling logistics
    - Subsurface cores and subsampling
  - Specific contaminant of concern (COC) considerations
    - Non-volatile and volatile
  - ISM replicates

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